ENVIRONMENTAL MONITORING
FUEL OIL STORAGE 1,600-AREA
FORT DEVENS
AYER, MASSACHUSETTS

Prepared for:
Department of the Army
New England Division
Corps of Engineers
Waltham, Massachusetts

Prepared by:
Goldberg-Zoino & Associates, Inc.
Newton Upper Falls, Massachusetts

File No. U-10391.9
January 1989

GOLDBERG·ZOINO & ASSOCIATES, INC.
CONSULTING ENGINEERS/GEOLOGISTS/ENVIRONMENTAL SCIENTISTS

The GEO Building 320 Needham Street Newton Upper Falls, MA 02164
(617) 969-0050

January 4, 1989
File No. U-10391.9-C

Division Engineer
Department of the Army
New England Division, Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02254-9149

Attention: Mr. Yuri Yatsevich

Re: Environmental Monitoring
Fuel Oil Storage 1,600-Area
Fort Devens
Ayer, Massachusetts

Gentlemen:

Goldberg-Zoino and Associates, Inc. (GZA) has completed observation of soil removal performed at fuel oil storage 1600-Area at Fort Devens in Ayer, Massachusetts, and reviewed results of associated soil analyses for petroleum hydrocarbons. In accordance with a proposal dated October 18, 1988, GZA evaluated the degree of oil contamination present in soils in the tank yard area using visual, odor and instrument measurement criteria, observed excavation of crushed stone and sand that was determined to be contaminated using these criteria, and performed laboratory analyses for total petroleum hydrocarbons. This letter report is subject to the general limitations presented in Appendix A.

These services were provided under contract with the Department of the Army, New England Division, Corps of Engineers; contract number DACA33-87-D-0003, Delivery Order No. 9.

FIELD ACTIVITIES

The site was formerly the location of seven aboveground 10,000 gallon No. 2 fuel oil tanks, underlain by crushed stone, sand, and a polyethylene liner. Excavation of contaminated crushed stone and sand was performed on October 21, 1988 by the U.S. Army. GZA field services were provided by Mr. Richard Levergood. GZA observed in-situ soil conditions, and assessed the soil for evidence of oil contamination using visual and odor criteria and field screening for volatile organic compounds (VOCs). A jar headspace technique was employed for the field screening, using a 10.2 eV photoionization detector (H-Nu Model PI-101).

The attached field sketch shows the approximate locations where field screening of in-situ soil was performed. Instrument readings greater than 10 parts per million (ppm), visible staining, and the presence of a petroleum odor were used as criteria to identify oil contaminated soil. Soil determined to be contaminated by these criteria was excavated by the U.S. Army using a front-end loader. The areas where excavation was performed are shown in Figure 1 (Areas 1 through 6B). Excavated soil was removed from the immediate area for management by the U.S. Army. A field report summarizing work performed is included in Appendix B.

A total of six composite soil samples (S-1 through S-6) were obtained at the limits of the excavated areas after work was completed on October 21, 1988. The samples were submitted to Water Control Laboratories of Hopkinton, Massachusetts for total petroleum hydrocarbon (TPH) analyses.

RESULTS

Table 1 summarizes results of VOC field screening of in-situ soil. Screening indicated VOC concentrations in the jar headspace of 0 to 40 ppm. Areas of soil were excavated where screening indicated concentrations greater than 10 ppm. Soil areas where screening indicated less than 10 ppm was left in place.

Laboratory reports of TPH analyses are included in Appendix C. The results indicate the soil samples contained 26 to 507 mg/kg total petroleum hydrocarbons. Each sample submitted to the laboratory for TPH analysis was also field screened for VOCs using the jar headspace technique. Table 2 summarizes H-Nu field screening results and corresponding TPH analytic results. Field screening indicated VOC concentrations in the jar headspace of 0 to 10 ppm.

For the purpose of comparison, the December 1987 Massachusetts Department of Environmental Quality Engineering (DEQE) policy guideline sets a remediation goal of 100 ppm on soil contaminated with virgin fuel oil. This is not a regulatory standard; the DEQE may set site specific remedial goals as appropriate.

This letter concludes our activities on this project. We trust that the information presented here satisfies your requirements.

We have appreciated the opportunity to assist you with this project, and look forward to continued involvement with the Army Corps of Engineers.

Very truly yours,

GOLDBERG-ZOINO & ASSOCIATES, INC.

Roger P. Thibault
Project Manager

Sara Hanna
Consultant/Reviewer

Joseph D. Guertin, Jr., P.E.
Principal

RPT:SH:JDG/idm
Attachments: Tables
Figures
Limitations
Field Report
Contract Laboratory Results

TABLES

File No. U-10391.9
01/03/88

TABLE 1

RESULTS OF VOLATILE ORGANIC COMPOUND FIELD SCREENING[1]

No.	VOC Headspace Concentration (ppm)	Area	Approximate Depth from Ground Surface (in.)	Notes[2]
1	0	1	8	Residual
2	0	1	8	Residual
3	40	2	8	Excavated
4	11	2	6	Excavated
5	0	1	6	Residual
6	0	1	6	Residual
7	0	1	6	Residual
8	0	1	6	Residual
9	2	2	6	Residual
10	0	2	6	Residual
11	0	2	6	Residual
12	40	6A	6	Excavated
13	0	6A	6	Residual
14	0	6A	6	Residual
15	0	6A	6	Residual
16	20	2	6	Excavated
16A	0	2	6	Residual
17	1	2	6	Residual
18	0	2	6	Residual
19	0	2	9	Residual
20	11	6A	6	Excavated
21	0	6A	6	Residual
22	0	6A	8	Residual
23	14	6B	8	Excavated
24	0	6B	6	Residual
25	12	5	6	Excavated
26	14	5	8	Excavated
27	0	5	6	Residual
28	0	5	8	Residual
29	0	6B	36	Residual
30	0	4	6	Residual
31	0	4	6	Residual
32	7	3	6	Residual
33	15	3	6	Excavated
33A	3	3	6	Residual
34	34	3	6	Excavated

TABLE 1 (CONT'D)

Notes:

1. Total volatile vapor analysis performed on samples employing H-Nu Model PI-101 photoionization analyzer. Samples were collected in 8 oz. glass jars and sealed, allowing vapor to collect in headspace. Volatile organic vapor in headspace was tested in the field. The H-Nu results represent relative total organic vapor levels referenced to a benzene standard.

2. "Residual" indicates soil remaining at the limits of excavation upon completion.

File No. U-10391.1
01/03/88:idm

TABLE 2

SAMPLES SUBMITTED FOR
TOTAL PETROLEUM HYDROCARBON (TPH) ANALYSIS

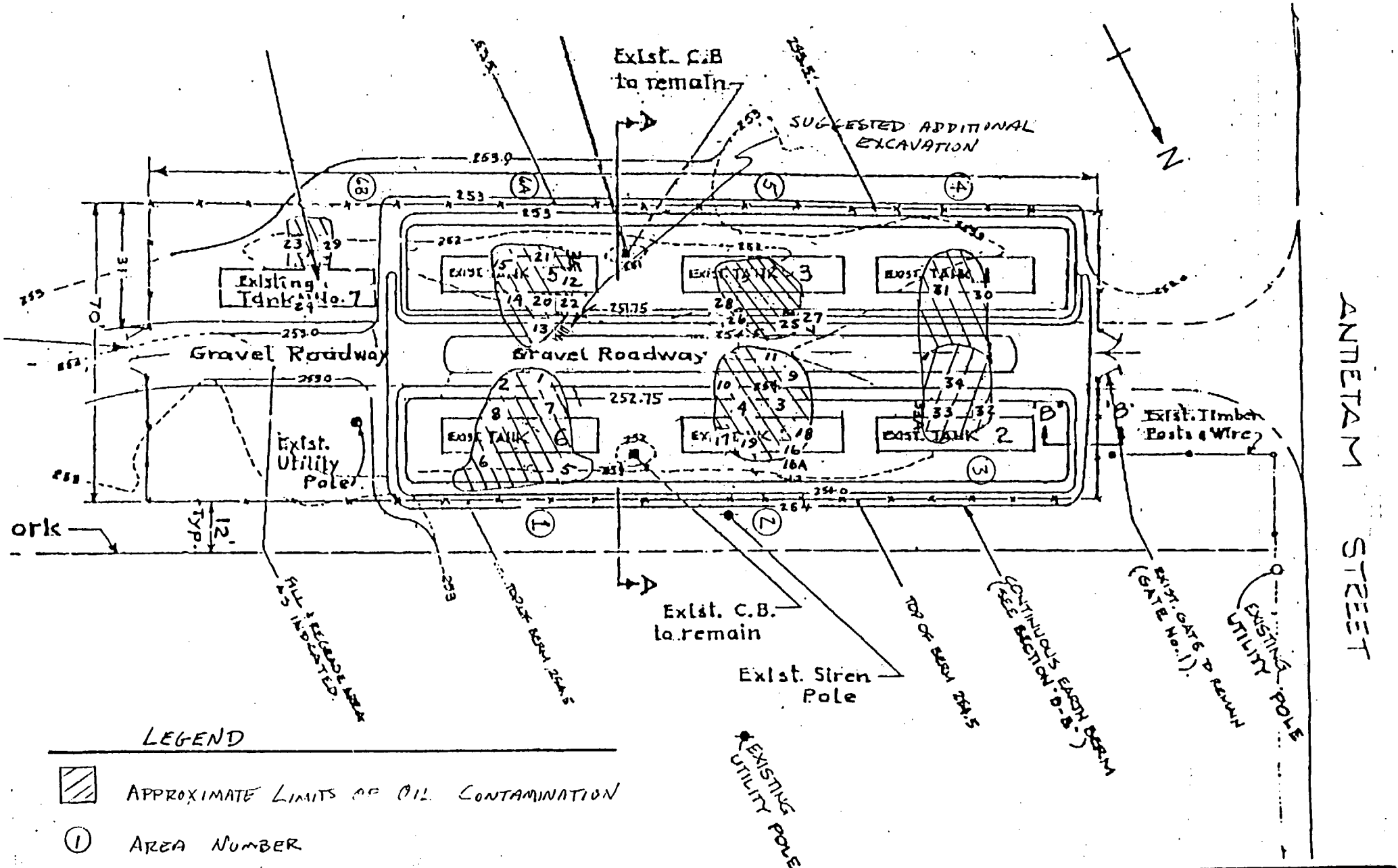
Sample No.	Sample Source	H-Nu Field Screening Results[1] (ppm)	TPH Analytic Results[2] (mg/kg)
SS-1	Area 1	0	26
SS-2	Area 2	0	39
SS-3	Area 3	0	110
SS-4	Area 4	4	507
SS-5	Area 5	0	115
SS-6	Areas 6A, 6B	10	380

Notes:

1. Total volatile vapor analysis performed on samples employing H-Nu Model PI-101 photoionization analyzer. Samples were collected in 8 oz. glass jars and sealed allowing vapor to collect in headspace. Volatile organic vapor in headspace was tested in the field.

2. Analysis was performed by Water Control Laboratories of Hopkinton, Massachusetts. Results added to report on November 8, 1988.

FIGURES



FORT DEVENS SOIL REMOVAL U-10391.9
AYER, MA 10-21-88

APPENDIX A

LIMITATIONS

APPENDIX A

LIMITATIONS

1. The analyses and recommendations submitted in this report are based on part upon the data obtained from surface explorations. Variations between these explorations may become evident with further investigation. If such variations appear, it will be necessary to reevaluate the recommendations and conclusions of this report.

2. The analysis, recommendations, and conclusions submitted in this report are based upon chemical data and are contingent upon their validity. These data have been reviewed and interpretations made in the text and on the figures included with this report. It should be noted that fluctuations in the types and levels of contaminants and variations in their flow paths may occur due to seasonal water fluctuations, past practices used in disposal, as well as other factors.

3. Chemical analyses have been performed for a specific number of parameters during the course of this study, as detailed in the text. It must be noted that additional constituents not searched for during the current study may be present in soil and groundwater at the site.

APPENDIX B

FIELD REPORT

FIELD SUMMARY

DATE 10/21/88 REPORT NO. 1 FILE NO. U-10391.9
PROJECT Fort Devens Soil Removal LOCATION Ayer, MA
CLIENT U.S. Army Corps of Engineers CONTRACTOR U.S. Army
WEATHER CONDITIONS Cloudy, 50's
ATTACHMENTS Field Sketch and Tables 1 and 2

1. Arrived on site at 0730 hours.

2. Equipment Working:

   a. 1- 6-Wheel Dump Truck
   b. 1- Front-End Loader

3. Work Performed:

   At the request of Mr. Yuri Yatsevich (U.S. Army Corps of Engineers), the undersigned arrived on site to observe removal of oil contaminated soil from a fuel oil storage tank yard. Soil was assessed for evidence of oil contamination using visual, odor, and jar headspace criteria. A 10.2 eV photoionization analyzer (H-Nu model PI-101) was employed in the jar headspace technique. Instrument readings greater than 10 ppm, visible staining and the presence of a petroleum odor were used as criteria to identify oil contaminated soil.

   The fuel oil storage tanks had been removed from the site prior to arrival of the undersigned. Fill within the limits of the tank yard consisted of approximately 12-inches of surficial crushed stone, underlain by approximately 6-inches of sand and a single layer of plastic liner. The contractor had previously excavated some crushed stone and sand in Areas 1 and 2.

   The undersigned was accompanied by Mr. Harish Sharma (U.S. Army) throughout the day while excavation was being performed. Field screening of residual crushed stone and sand above the plastic liner in Areas 1 and 2 indicated total volatile organic compound (VOC) concentrations exceeding 10 ppm in the jar headspace. Field screening of crushed stone and sand in Areas 3, 4, 5, 6A and 6B also indicated VOC concentrations exceeding 10 ppm. The crushed stone and sand appeared stained in some areas. Stained areas were localized and generally not well defined. A faint to strong petroleum odor was present. Approximate limits of oil contamination, as defined by visual, odor and 10 ppm instrument reading criteria, are shown on the Field

Sketch. Oil contamination appeared limited to fill material above the plastic liner.

The contractor excavated soil in these areas until H-Nu readings less than 10 ppm were obtained in the residual soil. Approximate depth of excavation varied between 6 and 18-inches in Areas 1, 2, 3, 4, 5, and 6A. Excavation depth in Area 6B, where a well defined area of darkly stained soil was removed, varied from 12- to 48-inches. Table 1 summarizes field screening test results obtained in excavated and residual soil in each area. The Field Sketch shows approximate locations of these tests.

At the request of Ms. Beverly Eloian (U.S. Army), 6 samples of residual fill above the plastic liner were obtained at the limits of the excavation in Areas 1 through 6B. Each sample is a composite of several subsamples of material from a given area. Areas 6A and 6B were combined into one sample. Table 2 summarizes sample numbers, source areas, and the results of field screening performed on the composite samples. Field screening indicated VOC concentrations in the headspace were less than 10 ppm for samples SS-1 through SS-5, and 10 ppm for sample SS-6. The undersigned suggested to Mr. Sharma extension of the lateral limits of excavation in Area 6A, as shown on the Field Sketch. A faint petroleum odor was detected at this location at the end of the day.

The samples were delivered to Water Control Laboratories of Hopkinton, Massachusetts on October 25, 1988 for Total Petroleum Hydrocarbon (TPH) analysis. Analytic results were received by GZA on November 7, 1988, and are listed in Table 2.

4. Left site at 1630 hours.

ON-JOB TIME	8.5
TRAVEL TIME	1.0
OFFICE TIME	1.0
TOTAL TIME	10.5

Richard Levergood
PREPARED BY

REVIEWED BY

APPENDIX C

CONTRACT LABORATORY REPORTS

WATER CONTROL LABORATORIES
A DIVISION OF COOPERATING MANAGEMENT INC.
HOPKINTON INDUSTRIAL PARK
106 SOUTH ST.
HOPKINTON, MA 01748
508-435-6824

82991956 000504 E01 1

V-10391.9 (SS-1)
FORT DEVENS SOIL REM

AYER MA

REFERRED BY:

GOLDBERG, ZOINO & ASSOCIATES
320 NEEDHAM ST.

NEWTON UPPER FALL,MA

10/21/88 00:00 | 10/25/88 19:11 | 10/27/88 16:06

FINAL REPORT

*** GENERAL INFORMATION
(COLLECTOR: GZA)

*** ORGANIC TESTING (SOIL
PET HYDROCARBON (IR) 26 MG/KG
*** THIS IS A FINAL REPORT. ***

WATER CONTROL LABORATORIES
A DIVISION OF COOPERATING MANAGEMENT INC.
HOPKINTON INDUSTRIAL PARK
106 SOUTH ST.
HOPKINTON, MA 01748
508-435-6824

82991955 000504 E01 1

V-[0391.9 (SS-2)
FORT DEVENS SOIL REM

AYER MA

REFERRED BY:

GOLDBERG, ZOINO & ASSOCIATES
320 NEEDHAM ST.

NEWTON UPPER FALL,MA

10/21/88 00:00 | 10/25/88 19:11 | 10/27/88 16:04

FINAL REPORT

*** GENERAL INFORMATION
(COLLECTOR: GZA)

*** ORGANIC TESTING (SOIL
PET HYDROCARBON (IR) 39 MG/KG
*** THIS IS A FINAL REPORT. ***

A DIVISION OF COOPERATING MANAGEMENT INC.
HOPKINTON INDUSTRIAL PARK
106 SOUTH ST.
HOPKINTON, MA 01748
508-435-6824

82991954 000504 E01 1

V-1039.9 (SS-3)
FORT DEVENS SOIL REM

AYER MA

REFERRED BY:

GOLDBERG, ZOINO & ASSOCIATES
320 NEEDHAM ST.

NEWTON UPPER FALL,MA

10/21/88	10/25/88	10/27/88
00:00	19:10	16:05

FINAL REPORT

*** GENERAL INFORMATION
(COLLECTOR: GZA)

*** ORGANIC TESTING (SOIL
PET HYDROCARBON (IR) 110 MG/KG
*** THIS IS A FINAL REPORT. ***

A DIVISION OF COOPERATING MANAGEMENT INC.
HOPKINTON INDUSTRIAL PARK
106 SOUTH ST.
HOPKINTON, MA 01748
508-435-6824

82991957 000504 E01 1

#V-10391.9 (SS-4)
FORT DEVENS SOIL REM

AYER MA

REFERRED BY:

GOLDBERG, ZOINO & ASSOCIATES
320 NEEDHAM ST.

NEWTON UPPER FALL,MA

COLLECTED	RECEIVED	REPORTED
10/21/88 00:00	10/25/88 19:12	10/27/88 16:04

FINAL REPORT

*** GENERAL INFORMATION
(COLLECTOR: GZA)

*** ORGANIC TESTING (SOIL
PET HYDROCARBON (IR) 507 MG/KG
*** THIS IS A FINAL REPORT. ***

WATER CONTROL LABORATORIES
A DIVISION OF COOPERATING MANAGEMENT INC.
HOPKINTON INDUSTRIAL PARK
106 SOUTH ST.
HOPKINTON, MA 01748
508-435-6824

82991953 000504 E01 1

V-10391.9 (SS-5)
FORT DEVENS SOIL REM

AYER MA

REFERRED BY:

GOLDBERG, ZOINO & ASSOCIATES
320 NEEDHAM ST.

NEWTON UPPER FALL,MA

10/21/88 00:00 | 10/25/88 19:09 | 10/27/88 16:05

FINAL REPORT

*** GENERAL INFORMATION
(COLLECTOR: GZA)

*** ORGANIC TESTING (SOIL
PET HYDROCARBON (IR) 115 MG/KG
*** THIS IS A FINAL REPORT. ***

WATER CONTROL LABORATORIES
A DIVISION OF COOPERATING MANAGEMENT INC.
HOPKINTON INDUSTRIAL PARK
106 SOUTH ST.
HOPKINTON, MA 01748
508-435-6824

82991958 000504 E01 1

V-10391.9 (SS-6)
FORT DEVENS SOIL REM

AYER MA

REFERRED BY:

GOLDBERG, ZOINO & ASSOCIATES
320 NEEDHAM ST.

NEWTON UPPER FALL,MA

10/21/88	10/25/88	10/27/88
00:00	19:12	16:06

FINAL REPORT

** GENERAL INFORMATION
(COLLECTOR: GZA)

** ORGANIC TESTING (SOIL
PET HYDROCARBON (IR) 380 MG/KG

*** THIS IS A FINAL REPORT. ***